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Aging, Proximity to Death, and Religiosity

MARIE LECHLER AND UWE SUNDE

Considerable evidence has documented that the elderly are more religious and that religiosity is associated with better health and lower mortality. Yet, little is known about the reverse role of life expectancy or proximity to death, as opposed to age, for religiosity. This paper provides evidence for the distinct role of expected remaining life years for the importance of religion in individuals' lives. We combine individual survey response data for more than 300,000 individuals from 95 countries over the period 1994–2014 with information from period life tables. Contrary to wide-held beliefs, religiosity decreases with greater expected proximity to death. The findings have important implications regarding the consequences of population aging for religiosity and associated outcomes.

Introduction

A considerable body of empirical research has documented positive associations between religiosity—the strength of religious belief, piety, devoutness—and well-being at the individual level. In particular, religiosity has been associated with better physical and mental health (Koenig, King, and Carson 2012; Smith et al. 2012; Aldwin et al. 2014; Zimmer et al. 2016; Opsahl et al. 2019), higher levels of subjective well-being and happiness (Inglehart 2010; Lun and Bond 2013), and greater resilience and coping capacities among the elderly (Wilkinson and Coleman 2010; Malone and Dadswell 2018). On the aggregate level, religiosity has been found to correlate with better economic performance and higher levels of development (McCleary and Barro 2003, 2006; Guiso, Sapienza, and Zingales 2003; Noland 2005;

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Qayyum, Anjum, and Sabir 2019). At the same time, empirical studies have reported mounting evidence about an age gap in religiosity (see, e.g., Ainlay, Singleton, and Swigert 1992; Argue, Johnson, and White 1999). According to recent findings, younger individuals identify less with a religion, are less likely to believe in God or to engage in a variety of religious practices than older individuals.¹

In a world where population is aging, this raises the question about the consequences of demographic change for religiosity and the related implications for public health, well-being, and development in general. In particular, the consequences of aging depend on whether the age gap captures a life-cycle profile in religiosity or a shift across cohorts. At the same time, rapid increases in life expectancy due to improved medical technology not only induce shifts in the age distribution but generate substantial variation in the relation between age and proximity to death, so that that individuals might grow older in terms of chronological age while their remaining life years might stay constant or even increase (Sanderson and Sherbov 2005, 2013).

This paper investigates the role of remaining life expectancy for religiosity, thereby disentangling the distinct roles of proximity to death and chronological age (hereafter, simply age). In contrast to age, the role of the proximity to death for religiosity has received little attention. This is surprising in light of the role of death and afterlife in behavioral models of religiosity and religious activity (attending religious services, praying, etc.). Such models are mostly based on the notion that religiosity provides benefits that outweigh the costs of religious participation. These could be benefits to be experienced during afterlife, corresponding to the “salvation motive for religious participation” or perhaps religion helps individuals to deal with unpleasant living conditions (or expectations) in earthly life. The salience of these motives is therefore associated with expected proximity of death. Typically, higher age is used as proxy in this context, and findings of higher church attendance and religious activity among elderly that have been reported in recent empirical studies are consistent with this interpretation. However, age is not necessarily a good measure of proximity to death. Age might be associated with religiosity through channels other than proximity to death, such as accumulating life experiences. Moreover, age is not fully exogenous to individuals’ religiosity in light of evidence that religiousness has a positive effect on health. A similar argument applies to subjective beliefs about proximity to death, which have been used in the existing empirical work on this topic.

The analysis presented here is based on a combination of individual survey response data on religiosity, age, sex, and country of residence spanning more than 300,000 individual observations from 95 countries over the period 1994–2014 with information about expected remaining life years from period life tables referring to the respective age and sex cells in these

countries. Information about expected remaining life years obtained from life tables is plausibly exogenous to individuals' religiosity. The fact that this information about life expectancy varies by age, sex, country, and over time allows identifying the effect of proximity to death and disentangling it from age- and cohort effects.

The empirical results show that the association of age with religiosity is weakly positive and exhibits a moderate U-shaped pattern when restricting attention to age only, paralleling earlier findings in the literature. When considering expected remaining life years without accounting for age, the results show a weakly positive effect of proximity to death on the importance of religion. When disentangling the effects of chronological age in terms of years since birth and proximity to death, however, the results reveal strikingly different patterns. In particular, the findings point towards a significant negative association between proximity to death (i.e., fewer expected remaining years of life) and religiosity holding age fixed. At the same time, the subjective importance of religion increases with age conditional on the expected remaining years of life. These results are robust when accounting for period- and cohort-specific shifts in religiosity, when controlling for various sociodemographic factors that might affect the subjective importance of religion, and when considering different religious faiths and denominations.

Formal models of religious participation typically predict participation to increase with age. However, already the early work by Azzi and Ehrenberg (1975) suggests that religious participation can decline at later ages as consequence of uncertainty about the time of death. In an early study on the subject, Ainlay, Singleton, and Swigert (1992) found no age pattern in religious attitudes but a decline in religious participation due to health-related limitations. Most subsequent theories of religiosity focused on age but made no distinction between age and life expectancy (Iannaccone 1998; Stolz 2009; Iyer 2016). The distinction between chronological age in terms of years since birth and a forward-looking definition of age reflected by remaining life expectancy adopted in this paper builds on seminal work in demography (Sanderson and Sherbov 2005, 2013). We are aware of no existing study that has tried to identify the role of remaining life expectancy for religiosity and the importance of religion in individuals' lives holding age fixed, thus disentangling the distinct roles of age and remaining years of life.

The findings are informative for economic models of religion as providing access to specific religious services (e.g., Iannaccone 1998; Iyer 2016) and complement evidence that relates to the role of religiosity for community-based redistribution (Gruber 2004; Gruber and Hungerman 2007, 2008; Berman and Laitin 2008; Ager and Ciccone 2018) by adopting a more individualistic perspective of religiosity. In this respect, our findings are related to increased religiosity in the context of shocks as predicted by

“terror management theories,” according to which religiousness increases with anxiety of dying, while anxiety of dying decreases as religiousness increases; see Jong et al. (2018) for a review of the literature. While the identification of this coping effect of religiousness is usually problematic as it relies on self-reported subjective anxiety, recent empirical work has established evidence that is consistent with this coping interpretation of religiosity using a credible identification strategy in the context of natural disasters (Bentzen 2019). The present paper takes an alternative approach by exploiting variation in life expectancy from life tables that is plausibly exogenous to individual religious beliefs and thus allows for an identification of the causal role of proximity to death while overcoming problems of endogeneity through correlations between religiosity, preferences regarding how long individuals want to live (which might depend on expectations of the quality of life in old age), and longevity.²

Our results also complement survey-based evidence for aging patterns and generational trends in religiousness. For instance, Bengtson et al. (2015) find that individual aging affects religious development over the life course and point to the relevance of cohort effects. Silverstein and Bengtson (2018) estimate the correlates of change in religiosity among baby-boom cohorts in the United States over age 50 on the basis of retrospective interview studies and find that religiosity is fairly stable, with some tendency to increased religiosity attributable to diminishing worldly concerns and better coping with partner loss or health problems. However, none of these studies considers the role of expected remaining life years for religiosity.

Instead of focusing on age, some research has concentrated attention on religiosity and its impact on health outcomes during the last year of life (Idler, Kasl, and Hays 2001; Idler, McLauhlin, and Kasl 2009). Recent work has also provided estimates of religious affiliation among older individuals and at the time of death, as well as projections of future religious composition by age and at the time of death (Skirbekk, Hackett, and Stonawski 2018a; Skirbekk, Todd, and Stonawski 2018b). Our evidence enriches this work by disentangling the role of age and proximity of death for religiosity.

There is a vast literature providing evidence that religiosity and religious participation affect health behavior and health outcomes. In general, religiosity appears to be associated with greater longevity and better health (see, e.g., Hummer et al. 2004; Koenig 2008; and Zimmer et al. 2016 for surveys of studies on the impact of religiosity on health and longevity). While most of this evidence is based on small and specific samples of subjects, some contributions provided evidence for health effects based on large national samples (Hummer et al. 1999). Deaton (2011) investigated the relationship between religiosity, age, and sex, as well as the effects of religiosity on health outcomes and health-related behaviors, using variation within and between countries. His findings point towards an increase in religiosity with age which is distinct from a cohort effect, while

religious individuals exhibit better self-reported health outcomes. Here we use cross-country panel data and a novel empirical strategy to explore the opposite direction of causality, from remaining life expectancy to religiosity.

Data and methods

Data

The empirical analysis is based on individual-level survey responses from the World Value Surveys (WVS).³ These surveys are conducted among nationally representative samples in almost 100 countries. The data are based on a common questionnaire that contains consistent and comparable sets of questions on various topics. The survey questions of main importance for the purpose of this study concern individual religious attitudes. The analysis in this paper mainly relies on responses to three questions. The main outcome variable asks respondents about whether religion is important in their lives, with a response scale from 1 (not important) to 4 (very important). A second question concerns the belief in God, with responses 0 (no) or 1 (yes). Intensity of beliefs are measured using responses to a question about importance of God in a respondent's life, with responses ranging from 1 (not important) to 10 (very important).⁴ The same questions have been used in previous work on religiousness using the WVS (e.g., Norris and Inglehart 2004; Bentzen 2019). The main analysis is based on responses to the question about the importance of religion in life. In robustness analysis, we also use the other questions or a composite measure based on a principal component analysis (PCA) of the responses to the three questions. The baseline sample for the empirical analysis contains information for survey rounds 3–6 (1994–1998, 1999–2004, 2005–2009, and 2010–2014).

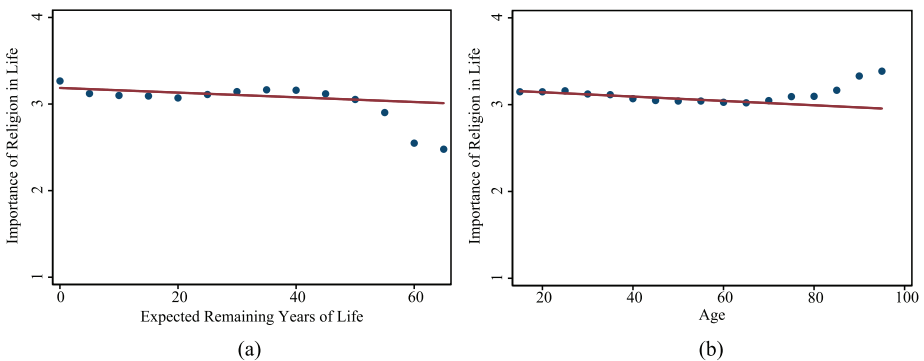
These data are linked with information about the life expectancy of a respondent of a given age and sex who lives in a particular country when the respective surveys are elicited. The data about the expected remaining years of life of an individual is based on information from period life tables assembled by the United Nations (UN 2015).⁵ These data are available for the periods 1990–1995, 1995–2000, 2000–2005, 2005–2010, and 2010–2015 and contain the respective information about expected remaining years of life for each country for age brackets of five years and separately for both sexes. We match these data to the corresponding WVS waves for five-year age brackets (Wave 3: 1995–2000, Wave 4: 2000–2005, Wave 5: 2005–2010, Wave 6: 2010–2015), which then allows assigning the life table information to individuals on the basis of their age reported in the respective WVS.⁶

The resulting estimation sample is an unbalanced panel data set comprising 311,360 individual responses from 95 countries for which the

TABLE 1 Descriptive statistics

	Mean	Standard Deviation	Minimum	Maximum	N
Importance of religion in life	3.10	1.05	1	4	311,360
Belief in God	0.88	0.33	0	1	203,147
Importance of God in life	7.78	2.99	1	10	292,181
Religiosity: composite measure (PCA)	0.00	1.00	-3	1	200,782
Remaining years of life	35.75	13.74	2	68	311,360
Age	40.70	16.09	15	97	311,360
Sex (1 = male)	0.48	0.50	0	1	311,360

NOTE: Summary statistics for the variables of main interest. See text for details.

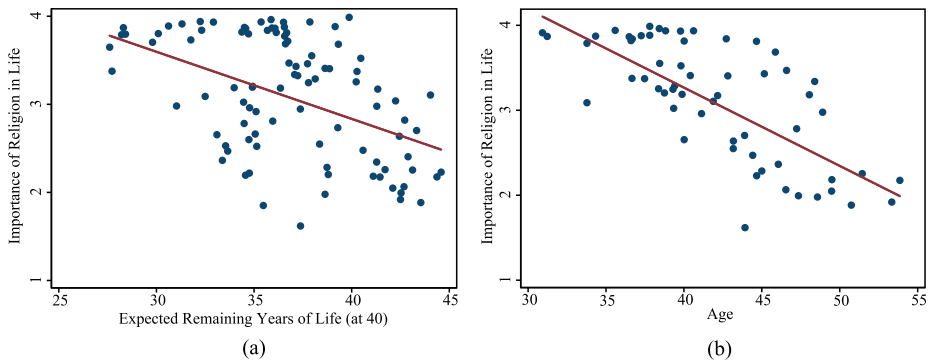
FIGURE 1 Age, life expectancy, and religiosity

NOTES: Unconditional scatter plots, data are plotted in 5-year bins for better visibility. Lines correspond to linear regression fits based on individual data. Religiosity is measured on a scale from 1 (not important) to 4 (very important). Panel (a): expected remaining years of life at current age. Panel (b): Age in years. See text for details on data sources.

relevant questions regarding religiousness and life expectancy contain nonmissing information. Descriptive statistics for the variables of main interest are contained in Table 1.⁷

Unconditional results

Figure 1 presents unconditional plots of the replies to the question about the importance of religion in life for different ages, using the pooled data at the individual level, in relation to remaining years and age, respectively. Figure 1a suggests that religiosity is higher the greater the expected proximity of death, whereas Figure 1b confirms earlier findings that the elderly report to be more religious than the young. In particular, religiosity is declining

FIGURE 2 Age, life expectancy, and religiosity: Country averages

NOTES: Unconditional scatter plots of country averages. Religiosity is measured on a scale from 1 (not important) to 4 (very important). Panel (a): Expected remaining years of life at age 40. Panel (b): Age in years. See text for details on data sources.

with age up to about 60 years of age. For older ages, religiosity exhibits an increase. The patterns are quantitatively moderate, however.

Figure 2 shows the corresponding patterns when restricting to country averages of the WVS samples. Figure 2a reveals that the finding that religiosity increases with a greater proximity to death is confirmed when considering country averages for the remaining life expectancy at age 40. At the same time, in countries with greater average age of the sample, religiosity is lower, as suggested by Figure 2b. At first sight, this contradicts the view that religiosity increases with age that was suggested from Figure 1b and in the literature. This can be rationalized by systematic differences in age composition and religiosity across countries, pointing towards the need for a more nuanced empirical strategy.

While these patterns are consistent with most of the findings in the literature, the problem is that age and remaining years of life are highly correlated. Unconditional estimates of the age pattern of religiosity without fixing life expectancy, and not accounting for systematic differences in religiosity that are, for example, due to the level of economic development, are therefore likely to deliver biased and unreliable results.

Estimation framework and identification strategy

In order to estimate the role of remaining life expectancy for religiosity and to disentangle this effect from the role of age, we apply an estimation framework that exploits variation in the remaining years of life that an individual of a given age and sex faces in the respective country at the respective point in time. The analysis is conducted for survey responses about religiosity, for example, in terms of the importance of religion in life, R_{iasct} , by individuals

i of age a in [15,97] and sex s (male or female) in country c at time (survey period) t as dependent variable. Religiousness is modeled as

$$R_{iasct} = g(x_{iasct}) + \sum_{a=15}^{97} \delta_a I(a = Age_{iasct}) + \gamma X_{iasct} + I_{a,s,c,t} + \varepsilon_{iasct} \quad (1)$$

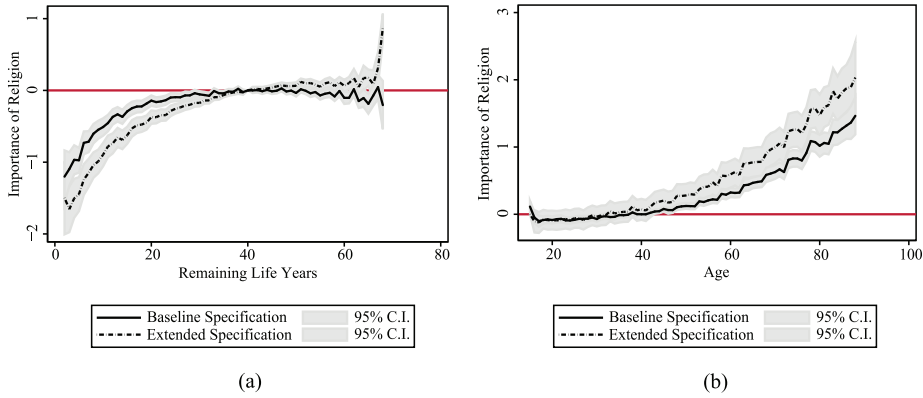
The main interest lies in the shape of the function of expected remaining years of life, $g(x_{iasct})$, which is specified as a parametric function (quadratic in the baseline) or a semiparametric function that allows for a flexible semiparametric estimation of coefficients of remaining years of life (in bins of one year), $\sum_{\tau=1}^T \beta_{\tau} I(\tau = x_{iasct})$, where $I(\cdot)$ represents the indicator function. To account for the effects of age on religiosity, which has been the focus in the existing literature, the model also includes a flexible (semiparametric) specification of the age profile, $\sum_{a=15}^{97} \delta_a I(a = Age_{iasct})$. In extended specifications, the model of religiosity also includes individual sociodemographic characteristics, such as education, income, number of children or marital status, which might affect religiosity and which are comprised in a vector X_{iasct} . In addition, the empirical framework includes a vector $I_{a,s,c,t}$ that contains additional binary indicator variables to account for systematic variation in religiosity across specific strata of the sample. In the baseline specification, this vector is given by

$$I_{a,s,c,t} = \delta_c + \delta_t + \delta_s, \quad (2)$$

and includes country-fixed effects, period-fixed effects to account for global trends and circumstances, as well as sex-fixed effects to account for the systematic differences in religiousness by sex that have been documented in the literature.⁸

The coefficients of main interest refer to the influence of expected remaining years of life that is reflected by the shape of $g(x_{iasct})$. Consistent estimation requires variation that allows identifying the effect of remaining life years above and beyond the influence of age, period, and birth cohorts. The specification of the empirical model implies that the identification of the estimates of interest relies on variation in remaining life years across age-sex-groups in a given country over time. Importantly, the flexible specification of the empirical model exploits variation over time in remaining life years within the same cohort in a given country and allows estimating a distinct coefficient for each year of remaining life expectancy (a vector of β -coefficients) and for each age (a vector of δ -coefficients). This implies that the estimates of the model of religiosity as a function of remaining years of life account for systematic differences in age, and vice versa, while using variation within a given birth cohort. The empirical model thereby delivers joint estimates of the respective patterns of the influence of remaining life years and of age and disentangles the distinct roles of age and expected remaining life years for religiousness. In additional analysis, we estimate

FIGURE 3 Age, life expectancy, and religiosity: Multivariate regression results



NOTES: Plots of coefficient estimates from various specifications. Dependent variable is Religiosity, measured on a scale from 1 (not important) to 4 (very important), the measure is standardized. Panel (a): effect of expected remaining years of life at current age. Panel (b): effect of age in years. Shaded areas represent confidence intervals based on ± 1.96 standard deviations around point estimates. The baseline specification of the empirical model corresponds to Table 2(1), the extended specification corresponds to Table 2(6).

extended specifications that include explicit controls for birth cohort effects or interaction terms between the binary indicator variables,

$$I_{a,g,c,t} = \delta_{ct} + \delta_{sa}, \tag{2a}$$

that allow for period-specific country effects or sex-specific age effects, respectively, and include various other control variables.⁹

All specifications of the empirical model are estimated by least squares, with the error term ε_{iasct} allowing for clustering at the country-age-sex-period level.

Results

Main results

Figure 3a depicts the results from estimating the baseline specification and the extended specification of the empirical framework while applying a flexible (semiparametric) specification of the effect of remaining years of life, $g(x_{iasct})$. Figure 3b shows the corresponding age pattern. These results suggest that religiosity begins to decline at about 20 years before the expected death, keeping age fixed. At the same time, fixing expected remaining life years, religiosity increases at older ages, confirming the findings in the literature about greater importance of religion reported by the elderly. These findings put the unconditional results of Figures 1 and 2 into perspective. In particular, the conclusion of a sharp increase in religiosity at age 60 in Figure 1b or even a decline in when considering country averages in Figure 2b

are likely the result of bias due to the omission of controlling for systematic differences in remaining life expectancy and variation in religiosity across countries; for example, due to differences in economic and social development or secularization. Both are accounted for in the estimation framework that underlies the results in Figure 3.¹⁰ Moreover, the graphs document that the effects of expected remaining life years and age are nonlinear. Religiousness varies little with life expectancy above 30 years or more, but falls increasingly sharply with a greater proximity of death. Likewise, religiosity varies little with age below 40, but increases with a convex shape at older ages.

Table 2 presents the main results of the empirical analysis regarding the role of proximity to death for religiosity. The results refer to a quadratic specification of $g(x_{iasct})$ and are reported for different specifications of the control variables. The findings for the baseline specification in Column (1) confirm the descriptive results in terms of a significant positive effect of expected remaining years of life on religiosity, which corresponds to a decline in the importance of religion the greater the expected proximity to death. Importantly, this holds for keeping age fixed and accounting for systematic differences in religiosity across countries (by including country fixed effects), over time, and between the sexes. The results of the quadratic specification also confirm the finding of a nonlinear (concave) association. Since remaining life years and age are correlated, this might lead to concerns about multicollinearity. In fact, the correlation is highest for the cells with high ages and low remaining life years.¹¹ In order to explore the robustness of the result with respect to excluding parts of the sample with the highest correlation, Column (2) presents the results when restricting the sample to individuals younger than 60 years of age, for whom the correlation between age and remaining years is lower and potential selection is less prevalent. The results are qualitatively and quantitatively almost identical. The same is true for the estimation of extended specifications (2a) with controls for interactions between the binary indicator variables, as indicated by the results for specifications that account for country-specific period effects (Column (3)), for sex-specific age effects (Column (4)), or both (Column (5)). Alternatively, individual religiosity might be associated with individual factors that correlate systematically with remaining years of life or age. For instance, marital status, education, income, and subjective health status all correlate with age and presumably remaining life years. Moreover, personal attitudes regarding others, such as trust, might vary over the life cycle and correlate with religiosity. Finally, recent work in political science has provided evidence that preferences for institutions, in particular the preference for democracy, are influenced by lifetime experiences and the individual life horizon (Fuchs-Schündeln and Schündeln 2015; Lechler and Sunde 2019). The inclusion of controls for these other factors in the empirical specification leaves the main results unaffected (Column (6)).

TABLE 2 Main results: Importance of religion and expected remaining years of life

Sample:	(1) Full	(2) Age < 60	(3) Full	(4) Full	(5) Full	(6) Full
Remaining years	0.0299*** (0.0029)	0.0321*** (0.0030)	0.0414*** (0.0030)	0.0303*** (0.0033)	0.0447*** (0.0033)	0.0455*** (0.0038)
Remaining years ²	-0.000362*** (0.0000)	-0.000322*** (0.0000)	-0.000432*** (0.0000)	-0.000348*** (0.0000)	-0.000443*** (0.0000)	-0.000432*** (0.0000)
Country FE	✓	✓	✓	✓	✓	✓
Survey round FE	✓	✓	✓	✓	✓	✓
Age FE	✓	✓	✓	✓	✓	✓
Sex FE	✓	✓	✓	✓	✓	✓
Country x survey round FE			✓		✓	✓
Age × Sex FE				✓	✓	✓
Children						✓
Marital status						✓
Education dummies						✓
Income dummies						✓
Subject health						✓
Trust						✓
Democracy						✓
R ²	0.41	0.43	0.42	0.41	0.42	0.42
N	311,360	268,107	311,360	311,360	311,360	211,800
Cluster	3,211	2,160	3,211	3,211	3,211	2,698

NOTE: Multivariate regression estimates of different specifications of the empirical model (2). The dependent variable is the survey response to the question about the importance of religion in life, coded from 1 (not at all important) to 4 (very important); the measure is standardized. Standard errors clustered at the country-age-gender-period level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Robustness

The result of a decline in religiosity with greater proximity to death is robust to a variety of robustness checks. In particular, a potential concern for the validity and robustness of the results is multicollinearity due to the systematic correlation between remaining years of life and age. In order to explore the robustness of the results with respect to this concern, we computed variance inflation factors for the estimates for remaining years of life and age obtained on the full sample. The findings do not reveal any evidence for excessive multicollinearity.¹²

Second, the result is not driven by the particular measure of religiosity in terms of subjective importance of religion in life. The pattern also robustly emerges when using alternative measures of religiosity. This is illustrated by the results for alternative measures related to the subjective strength of religious beliefs, importance of God, or a composite measure of responses regarding the importance of religion, the belief in God, and the importance of God in life by ways of a principal component.¹³

The result is also robust to the use of alternative estimation methods. In particular, the results robustly emerge when applying interval regression methods that account for the interval censoring of responses as consequence of the coarse response scale.¹⁴

The result regarding a decline in religiosity as the expected remaining years of life decrease also robustly emerges for countries with different levels of socioeconomic development. In particular, the respective coefficient estimates from an extended specification that allows for different coefficients for each bin of remaining life years for the groups of OECD and non-OECD countries reveal very similar patterns.¹⁵ This is reassuring in light of the different levels of religiosity in rich and less developed countries.¹⁶

The main results are also robust to the inclusion of separate controls for birth cohorts. The joint identification of age, period, and cohort effects is possible due to the estimation of flexible, semiparametric specifications for five-year bins of age and cohort. Most importantly, the effect of remaining years of life on religiosity is identified from the variation in remaining life expectancy across country-age-sex cells.¹⁷ Besides a decline in religiosity for greater proximity to death and an increase in religiosity with age, the results document a decline in religiosity for later birth cohorts that is consistent with an increasing secularization among younger cohorts.¹⁸

Another method to identify cohort and period effects separately from the age pattern in religiosity is the inclusion of control variables that incorporate differences across cohorts in a nonlinear way (Heckman and Robb 1985).¹⁹ We apply this methodology building on the hypothesis that personality and beliefs are formed during the critical period of adolescence, when individuals are particularly susceptible to environmental conditions

(Arnett 2000). In view of the fact that democracies typically grant freedom of religion whereas religious practices are more regulated in less-democratic environments, we use the exposure to democracy during life as a cohort proxy variable for religiosity. This measure builds on existing work that has pointed out the role of the institutional environment for preferences for democracy (Fuchs-Schündeln and Schündeln, 2015). The estimation results for these extended specifications confirm the decline in religiosity the lower the expected number of remaining years of life as well as the increase in religiosity with age.²⁰

Finally, the result of a decline in religiosity with greater proximity to death consistently emerges also in other data sets. To explore the robustness of the main results, we replicated the analysis using the Gallup World Poll, which contains comparable information about the importance of religion and demographic characteristics as the World Value Survey. The results that emerge from this exercise are qualitatively and quantitatively almost identical to those obtained before.²¹

Religiosity, religious service attendance, and health

The analysis so far has focused on the role of proximity to death, as opposed to age, for religiosity. A potential explanation for the result of declining religiosity with greater proximity to death is a decline in the participation in religious activities, in particular in the attendance of religious services at the end of life. Indeed, the findings for alternative outcomes also reveal a similar pattern for the attendance of religious services as dependent variable.²² If health-related limitations imply reduced attendance, as suggested by evidence for older age by Ainlay, Singleton, and Swigert (1992), and if lower attendance is associated with lower subjective religiosity, either due to lower awareness or as consequence of less frequent and intense social interactions with other individuals during religious services, this might explain the empirical results as consequence of health deterioration at the end of life.

The robustness of the main results to the inclusion of subjective health status as a control variable should already account for a health confound to some extent. In order to explore the distinct predictions of a health effect working through attendance and a genuine effect of proximity to death, we also estimated more extensive specifications that allow for an interaction effect of health and remaining years of life.

The results for attendance as dependent variable show that better health indeed increases attendance of religious activities, while closer proximity to death reduces attendance.²³ A negative interaction between health and remaining years of life indeed indicates that better health partly compensates for the decline in religiosity closer to death, but the effect is too small to eliminate (or even reverse) the main result that religiosity

decreases with greater expected proximity to death. When considering the importance of religion as dependent variable, health is positively related to religiosity, whereas the interaction effect turns out to be insignificant. The positive health effect is indeed consistent with the previous literature. However, the main finding of a negative effect on religiosity of greater proximity to death remains unaffected by this extension.

Another, more direct, way to explore the possibility that the results for religiosity are driven by attendance of religious services is to control for attendance when conducting the main estimates. The respective estimation results reveal indeed that respondents state a greater importance of religion in their lives when they attend religious services more often.²⁴ The qualitative results regarding the decline of religiosity along with a decline in expected remaining years of life remain unaffected, however. Although the coefficient estimates are reduced to about half the size compared to the estimates reported in the main results, the patterns of religiosity with remaining years of life and age remain robust and significant.

Heterogeneity by sex, religious affiliation, and development

Heterogeneity by sex has been found to be a key feature of religiosity in the existing literature, with women being more religious than men.²⁵ This pattern also emerges in the estimation results of this paper, which reveal a significantly higher level of importance of religion in life for women than for men. A question that emerges in the context of the previous results is therefore whether there is not only a sex difference in average religiousness, but also in the life cycle patterns of religiosity. To account for differences in the age pattern, we estimated extended specifications of the empirical model (2a) that allow for sex-specific age effects. The results of these estimates reveal similar age patterns for women and men, although the age profile is slightly more pronounced for women.²⁶ To explore whether the role of remaining life years for religiousness varies systematically by sex, we also estimated extended specifications that allow for a sex-specific pattern of remaining lifetime. Again, the results reveal a similar pattern as for the baseline.²⁷ If anything, the decline in religiousness is even more pronounced for women, but the sex differences are not significant.

Religions differ in many dimensions, including behavioral norms, beliefs about afterlife, and concepts of salvation. This likely maps into the motives for religious participation and the role of proximity to death or age for religiosity. In order to investigate this issue and explore possible heterogeneity in the role of expected remaining life years for religiosity, we replicated the analysis separately for individuals reporting different religious affiliations. The main result regarding a decline in religiosity in association with

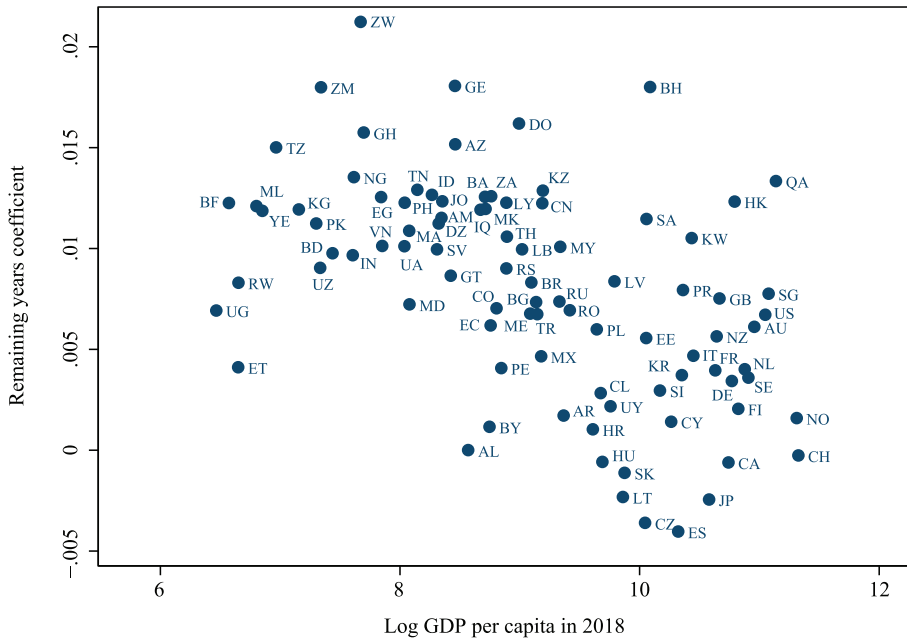
a smaller number of expected remaining years of life holds for respondents that report to be of Christian, Muslim, or Buddhist faith.²⁸ Together, these religious denominations cover more than 60% of the sample. The pattern is not significant (and even opposite in slope) for respondents that report to be of Hindu or Jewish faith. Together, these respondents only make up less than 4% of the sample, however. The pattern is qualitatively similar as in the full sample, although somewhat tilted to the positive and not significant, for individuals reporting to be member of no religion, who make up for around 17 percent of the sample.²⁹

Even within Christianity, the beliefs about afterlife as well as social norms differ substantially across denominations. For instance, recent work by Becker and Woessmann (2018) has pointed out that religious beliefs and social norms are a possible explanation for a higher propensity of suicide among Protestants compared to Catholics. Replicating the analysis for Catholics and Protestants indeed reveals differences in the gradient for remaining life years among the two denominations. In particular, the gradient is more pronounced for Protestants than for Catholics, which suggests a more pronounced erosion of religious beliefs.³⁰

To further explore heterogeneity in the nexus between remaining life years and religiousness with respect to the overall level of economic development, we replicated the analysis with a linear specification of the effect of expected remaining life years while allowing for country-specific slope parameters.³¹

The coefficient estimates are positive for the vast majority of countries in the sample, with smaller coefficient estimates for countries with higher levels of per capita income, as illustrated in Figure 4. In the estimation sample, religiosity and economic development exhibit a strong negative correlation across countries, but there is no significant relationship between average expected remaining years among survey respondents and economic development across countries. This implies that the pattern of heterogeneity is not due to sample composition. Instead, together with the result that religiosity is predicted to be lowest among a young population in environments with a short life expectancy, this finding implies that population aging in terms of increased life expectancy is expected to be associated with a stronger increase in religiosity in less developed countries, including many African countries. This provides important insights regarding the consequences of demographic aging for developing countries given that religiosity has been associated with faster economic development at the aggregate level and with better health and greater resilience at the individual level. In particular, the consequences of aging are expected to be stronger among less developed countries. At the same time, the results indicate that the effects of demographic change on religiosity and related outcomes might be limited among some of the more developed countries.

FIGURE 4 Effect of life expectancy on religiosity: Heterogeneity across countries



NOTES: Plots of coefficient estimates from a linear specification of the empirical model with country-specific slope parameters. Religiosity is measured on a scale from 1 (not important) to 4 (very important), the measure is standardized. With the exception of a linear effect of remaining years instead of a quadratic specification, the specification of the empirical model is the same as in Table 2(1).

Concluding remarks

This paper has provided new evidence on the association between expected remaining lifetime, age, and religiosity. Based on individual survey response data for more than 300,000 individuals from 95 countries over the period 1994–2014, we document that a decline in the expected remaining life years based on information from period life tables is associated with a decline in religiosity, holding age constant. At the same time, conditional on expected remaining life years, religiosity increases with age.

Our findings have important implications for the consequences of population aging. Sustained health improvements and medical progress boost expected remaining years of life across age groups. Fears of waning religiosity based on evidence of an age gap in religiosity that does not account for remaining life years may thus be unwarranted. In light of the positive association of religiosity with individual well-being and health, this points to important complementarities between medical progress and subjective individual aging experiences that are supported by religiosity. This corroborates calls for integrating religiosity in a holistic public health approach

towards aging (Zimmer et al. 2016; Malone and Dadswell 2018). In the comparative development context, the findings call for some caution regarding the implications of religiosity for economic performance in the aggregate, since religiosity is predicted to be lowest in the most underdeveloped countries where young populations are confronted with short life expectancies. At the same time, an expansion of life expectancy is expected to lead to a stronger increase in religiosity in less developed countries, partly as a consequence of the greater scope for improvements in life expectancy, partly as consequence of a stronger effect of remaining life years on religiosity.

In sum, the evidence sheds new light on the age pattern in religiosity and contradicts the widespread belief that religion gains importance for individuals the greater the proximity to death. Instead, the results show that the opposite is true when considering objective proximity as implied by life-table variation. This does not rule out that individuals that hold a subjective belief of dying sooner report a greater importance of religion. In this respect, the results of this paper are not incompatible with the relevance of subjective beliefs and psychological factors for religiosity that have been emphasized in theoretical explanations. To the extent that subjectively perceived life expectancy is often lower than actual life expectancies as suggested by recent work by Philipov and Sherbov (2020), the effect of remaining years of life on religiosity estimated here might constitute a lower bound of the total effect of the proximity to death. Disentangling the effects for religiosity of subjective perceptions about the length of the remaining life from the objective length as predicted by life table information constitutes a natural next step in this research agenda. This will require reliable and comparable data on subjective perceptions about the length of life as well as an empirical design that allows decomposing objective and subjective factors. Devising such an empirical approach that isolates the channels by disentangling the effects on different aspects of religiousness such as believing and belonging constitutes an interesting avenue for future research.

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Notes

1 A recent report by the Pew Research Center (2018) concludes, based on survey data from more than 100 countries, that younger adults are less religious than older adults, regardless of the economic or social environment in a country, or of the dominant religion in a country.

2 See, e.g., Bowen and Skirbekk (2017) and Bowen et al. (2019) for recent studies on the link between expectations about quality of life and the preference to die rather young and subjective expectations about the length of life, respectively.

3 The data are available at <http://www.worldvaluessurvey.org/wvs.jsp>.

4 A fourth question, which asks about agreement to the statement "life is meaningful because god exists," with responses 0 (disagree/neither) or 1 (agree) is not used due to the large proportion of missing responses.

5 The respective variable for life expectancy at exact age a (years), $x(a)$, is defined as average number of remaining years of life expected by a hypothetical cohort of females or males alive at age a who would be subject during the remaining of their lives to the mortality rates of a given period.

6 Andorra and Taiwan are not matched due to no available information in UN life tables. Serbia and Montenegro are dropped since they do not appear as separate countries in the UN Life Tables.

7 Table A1 in the Appendix contains descriptive statistics for other variables used in additional analyses.

8 More formally, (2) can be written as $\sum_c \delta_c I(c = \text{Country}_{iasct}) + \sum_t \delta_t I(t = \text{Period}_{iasct}) + \delta_s I(s = \text{Sex}_{iasct})$. Note that the respective patterns for remaining life years and age are identified relative to the respective reference category in each dimension. are identified relative to the respective reference category in each dimension.

9 Formally, (2a) can be written $I_{a,s,c,t} = \sum_c \sum_t \delta_{ct} I(c = \text{Country}_{iasct} \wedge t = \text{Period}_{iasct}) + \sum_a \sum_s \delta_{as} I(a = \text{Age}_{iasct} \wedge s = \text{Sex}_{iasct})$.

10 This conclusion is confirmed by the results of estimations with restricted samples that do not account for either age or remaining years in the estimation of the coefficients for the profiles of remaining years or age, respectively, or that do not include country-fixed effects. (See Figure A1 in the online Appendix containing Supporting Information.)

11 See Figure A2 in the Appendix. The raw correlation between age and remaining life years in the baseline sample is -0.92 ; in the sample aged less than 60 years, the correlation is -0.87 .

12 Figure A3 in the Appendix depicts the variance inflation factors for the semi-

parametric specification of the empirical model. They are below 10.

13 Estimation results for different outcomes are reported in Table A2 in the Appendix, and Figure A4 in the Appendix depicts the results of the semiparametric specification for the combined measure.

14 Figure A5 in the Appendix depicts the results for the baseline specification obtained from interval regressions.

15 Figure A6 in the Appendix shows the corresponding coefficient estimates for the baseline specification and for the extended specification.

16 See Figure A7 in the Appendix for the respective distributions of religiousness in the raw data and after conditioning for observables as in the baseline specification of Table 2, column (1).

17 All profiles, in particular regarding remaining years of life, age, and cohorts are identified relative to a reference group. The coefficient of this group reflects the average religiousness, and the absolute effects of age, remaining years, period and cohort on this average are not identified. Importantly, however, the relative effects of variation in the various dimensions, which are the object of main interest, are identified.

18 See Figure A8 in the Appendix for details.

19 This approach has been applied successfully in several contexts, including the identification of age patterns in risk attitudes (Dohmen et al., 2017).

20 See Figure A9 in the Appendix for details.

21 Figure A10 shows the results that correspond to the those in Figure 3 in terms of empirical specification based on data from the Gallup World Poll, 2012, wave.

22 See the results in Column (5) of Table A2 in the Appendix.

23 See Table A3 in the Appendix for details.

24 See Figure A11 and Table A4 for the respective results.

25 See, e.g., Pew Research Center (2016).

26 See Figure A12 in the Appendix for details.

27 See Figure A13 in the Appendix for details.

28 See Figure A14 in the Appendix for details.

29 The information about religious affiliation is missing for the remaining share of participants.

30 See Figure A15.

31 In particular, the estimation framework is a modified specification of the empirical framework (1) with $R_{iasct} = \sum_{c=1}^{95} \beta_c X_{iasct} I(c = Country_{iasct}) + \sum_{a=15}^{97} \delta_a I(a = Age_{iasct}) + \gamma X_{iasct} + I_{a,s,c,t} + \varepsilon_{iasct}$, where β_c corresponds to a country-specific slope coefficient for the effect of expected remaining life years.

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